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Immature Stages of *Tachytrechus auratus* (Diptera: Dolichopodidae)[1]

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Abstract.—Tachytrechus auratus (Aldrich) is a dolichopodid which inhabits freshet seeps and mud flats in east-central Washington. Development time from first instar to adult was 23 to 32 days. Pupal development was 4 to 7 days and maximum adult life span was 7 days. The third larval instar, larval mouth parts, pupa, and several different cocoons utilized by the pupae are illustrated with line drawings and photographs.

The dolichopodid genus *Tachytrechus* is one of 27 genera in the large subfamily Dolichopodinae (Ulrich 1980) and is represented in North America by 33 species (Robinson and Vockeroth 1981). Most of the biological and morphological information available about the genus is derived from data concerning several Palearctic species. These include *T. insignis* Stannius and *T. planitarsis* Becker (Vaillant 1951), and *T. notatus* Stannius (Vaillant 1949). To date, the only biological information for any Nearctic *Tachytrechus* is that presented by Kuenzel and Wiegert (1977) in their study of the energetics of *T. angustipennis* Loew.

MATERIALS AND METHODS

Tachytrechus auratus adults and larvae were collected from Boyer Seep and Crum Seep, 44.9 and 37.6 km respectively, SW of Pullman, Whitman County, Washington. The characteristics of these sites were detailed by Corpus (1983, 1986). Mud samples from these two sites were sieved through a series of brass screens, and the subsequent detritus was submerged in saline solution to extract active larvae. Individual larvae were set into separate dishes of fresh mud for further development. Dishes were kept under a 16L:8D photoperiod regime and checked daily. Newly emerged adults were collected and identified. Larval and pupal exuviae as well as intact pupae were also collected and preserved for description. Pupal cocoons were extracted after adult emergence, air dried, and sprayed with hair spray to preserve their structure. Descriptions and terminologies follow those of Dyte (1967), Smith (1952), and Beaver (1966).

LIFE HISTORY OBSERVATIONS

Adults of *T. auratus* are active from late April to mid-September. Under laboratory conditions the development time from first instar to emergent adult was

23 to 32 days (n = 7; $\bar{x}$ = 27.5). Larvae remained within the mud substrate to feed and complete development. Precise developmental periods for each instar were not determined since molting occurred within the mud, and larval exuviae were extracted only by sieve screening.

Tachytrechus auratus pupal development varied from 4 to 7 days (n = 7; $\bar{x}$ = 5.3). Pupae were detected by daily viewing of the mud surface in each dish under a dissecting scope and noting where respiratory horns protruded above the mud. The tips extended approximately 1–2 mm beyond the mud and moved in a scissoring motion when touched. After adult emergence, pupal exuviae remained wedged into the cocoon exit hole, although on occasion they were discarded on the surface of the mud.

Adult *Tachytrechus* fed readily upon small chironomid and muscid larvae placed into the rearing containers. Adult flies held prey against the substrate and rasped the prey integument until body fluids seeped out. They then fed on the exudate. When freshly killed cockroach nymphs were opened and placed into the rearing containers, several adult dolichopodids converged and commenced feeding on the body exudates. Adult longevity of *T. auratus,* in the laboratory, varied from 5–7 days (n = 7; $\bar{x}$ = 5.9).

Several other dolichopodids were reared from the same mud as *T. auratus*. These included *T. olympiae* (Aldrich), *Calyxochaetus sobrinus* (Wheeler), *Chrysotus argentatus* Van Duzee, *C. arcuatus* Van Duzee, and *Pelastoneurus vagans* Loew. In addition, a number of unidentified stratiomyid, tipulid, tabanid, ceratopogonid, chironomid, and sciarid larvae were extracted.

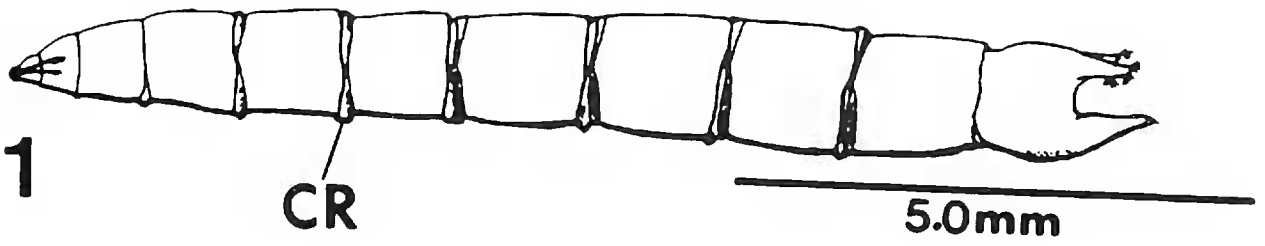
Descriptions of Immature Stages

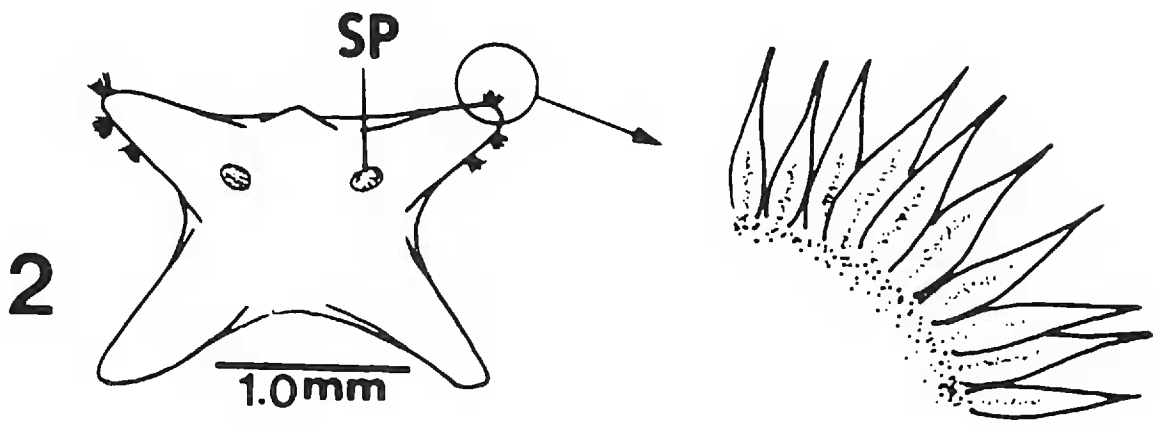
Egg.—Length 0.8–0.9 mm; width 0.40–0.45 mm; elliptical; white; chorion finely sculptured. (Based on 27 eggs, dissected from 4 females having 6, 6, 7, and 8 eggs, respectively.)

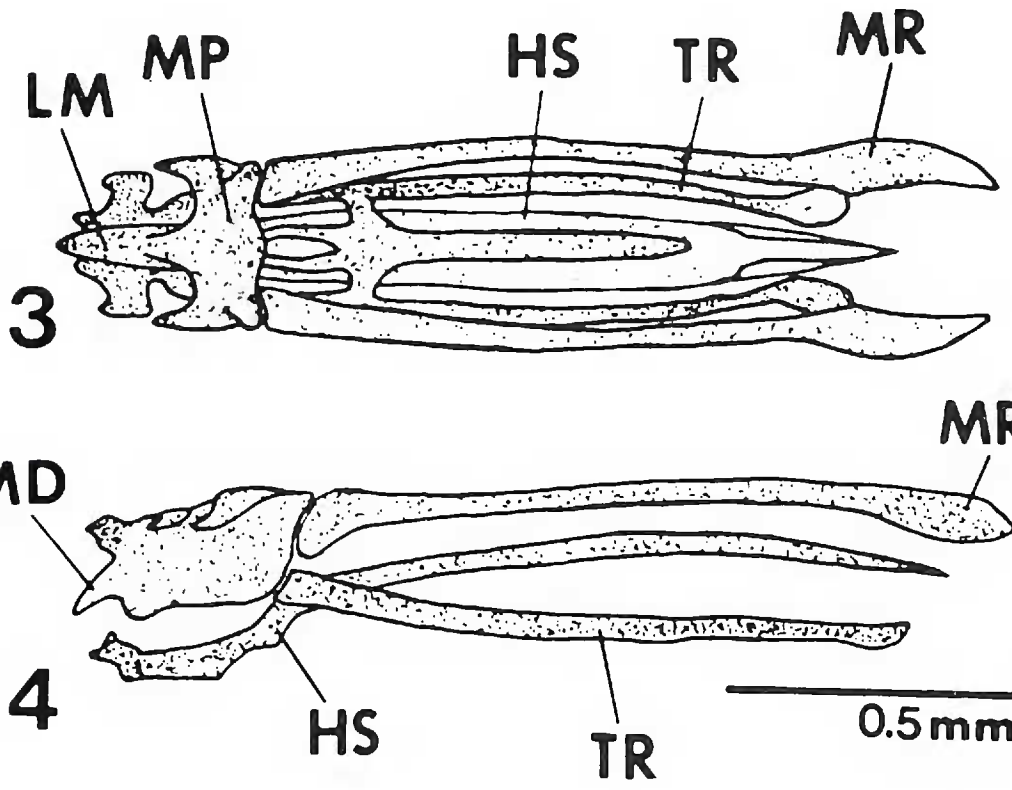
First larval instar.—Length 1.0–1.6 mm; maximum width 0.29–0.31 mm; 12-segmented; translucent to white; mouth parts black; caudal dorsolateral and ventrolateral lobes short, nearly equal in length; metapneustic; posterior spiracles indistinct, borne near tips of dorsoventral lobes. (Based on 3 larvae and 3 larval exuviae.)

Second larval instar.—Length 3.2–6.1 mm; maximum width 0.60–0.71 mm; 12-segmented; white; mouth parts black; ventrolateral lobes longer than dorsolateral lobes; amphipneustic; anterior spiracles on segment 2, minute; posterior spiracles black, minute, located near bases of dorsolateral lobes. (Based on 3 larvae and 3 larval exuviae.)

Third larval instar (Fig. 1).—Length 10.5–11.1 mm; maximum width 1.4–1.5 mm; 12-segmented; white to pale yellow; amphipneustic; mouth parts and posterior spiracles dark brown to black; body tapered anteriorly; truncate posteriorly; lateral body surface with fine, longitudinal striae; anterior spiracles 0.04 mm long, short-stalked; segments 4–11 with ventral crawling ridges composed of transverse rows of tiny, brown setulae and fleshy protuberances. Segment 12 with 6 caudally-directed lobes (Fig. 2); 2 dorsolateral lobes each bearing 3 hair tufts, tuft at apex of lobe comprised of 20–25 black, flattened hairs; lateral tufts each comprised of 20–30 hairs; Each ventrolateral lobe with 2 hair tufts; tuft at apex comprised of 20–25 hairs; tuft near lobe base comprised of 15–20 hairs. Lateral lobes small,



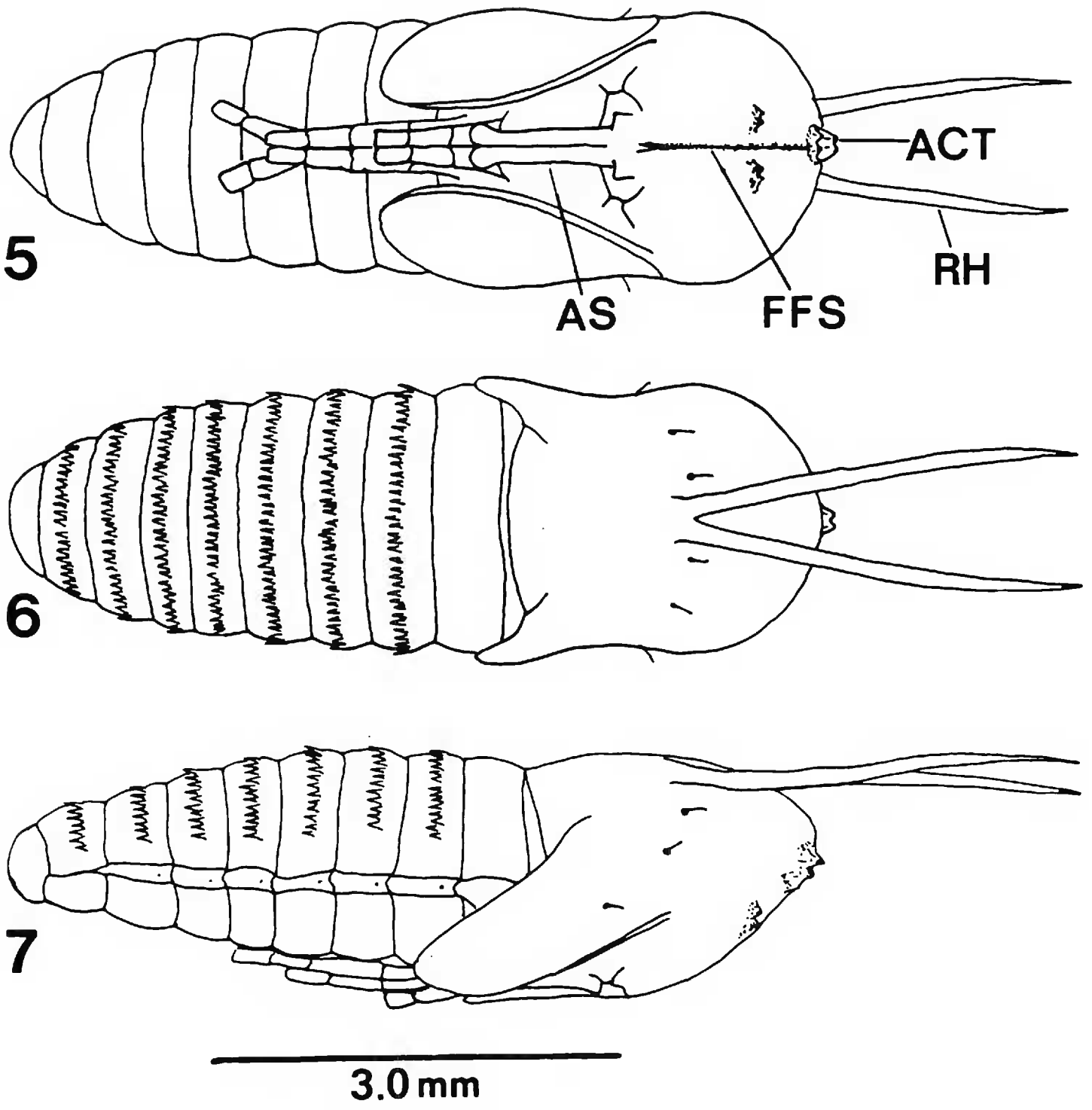




Figures 1–4. *Tachytrechus auratus*. 1. Larva, lateral view. 2. Posterior spiracular disc of segment 12 with enlarged hair tuft. 3. Larval mouth parts, dorsal view. 4. Same, lateral view. Abbreviations: (HS) hypopharyngeal sclerite. (LM) labrum. (MD) mandible. (MP) median plate. (MR) metacephalic rod. (TR) tentorial rod.

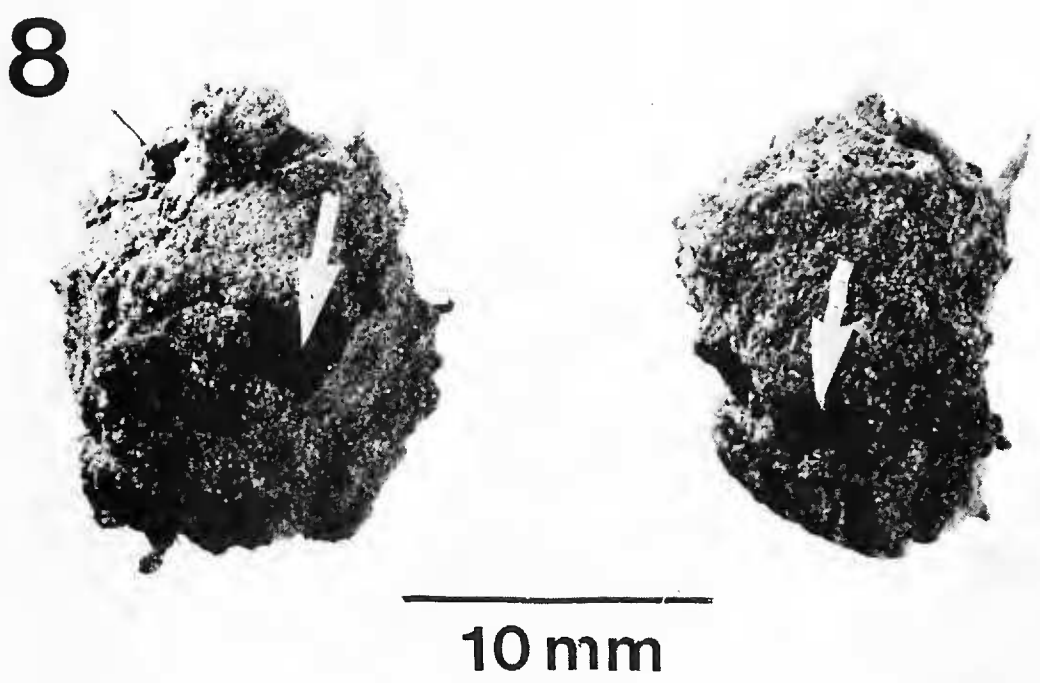
triangular, asetose. Perianal pad on venter of segment 12 elliptical, swollen; posterior spiracles located near bases of dorsolateral lobes, 0.54–0.60 mm apart; diameter of each spiracle 0.15–0.17 mm. (Based on 7 larvae.)

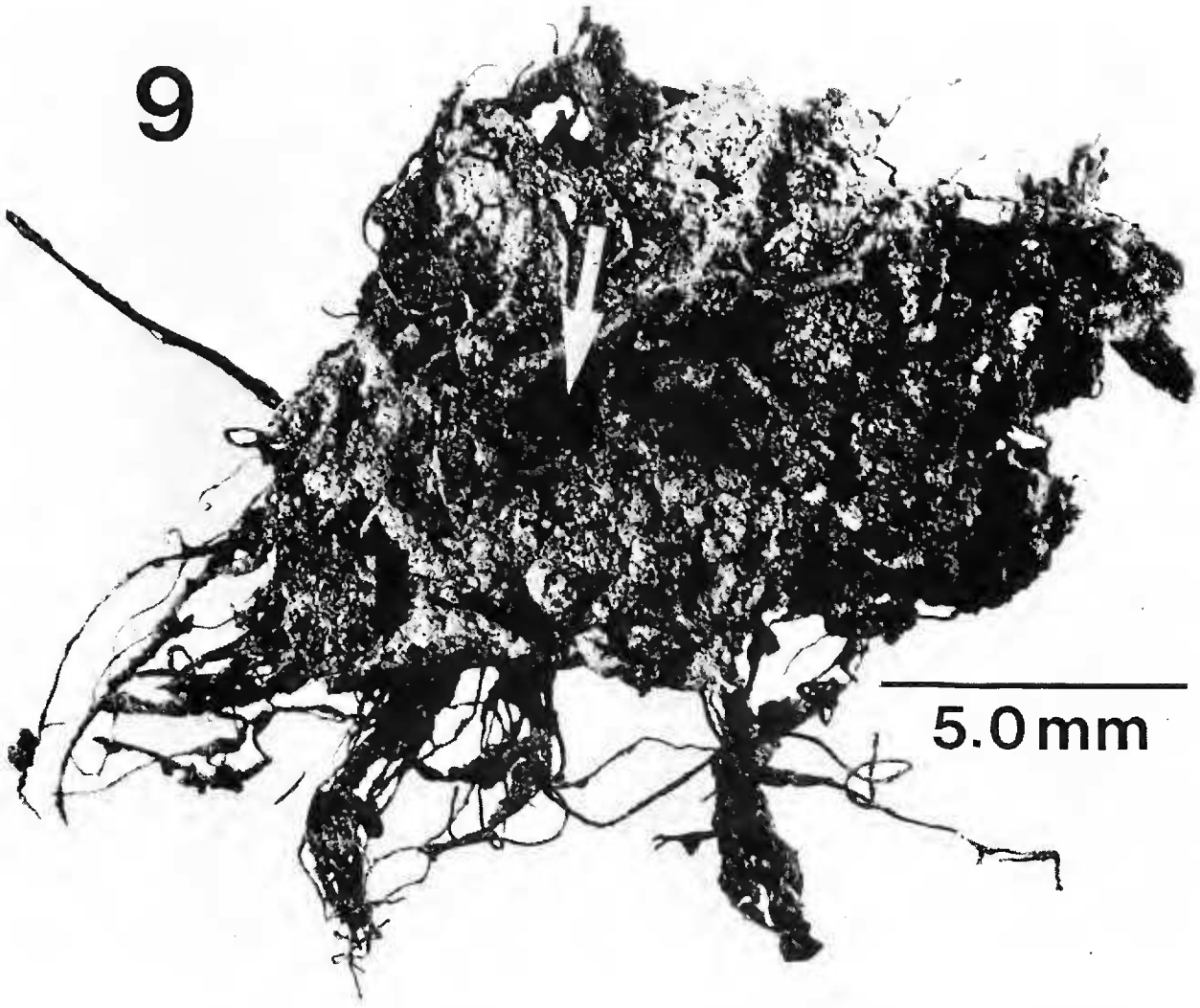
Larval mouth parts (Figs. 3, 4).—Labrum with acute tip; lateral arms of median piece with acute tips, projecting laterally and curving forward; hypopharyngeal sclerite 0.65–0.70 mm long, caudal tip acute, amber colored; metacephalic rods 0.75–0.81 mm long, black, caudal tips enlarged, acutely pointed toward meson; tentorial rods 0.70–0.74 mm long, black, caudal tips broad, spatulate, curved mesally. (Based on 5 third instar head capsules.)



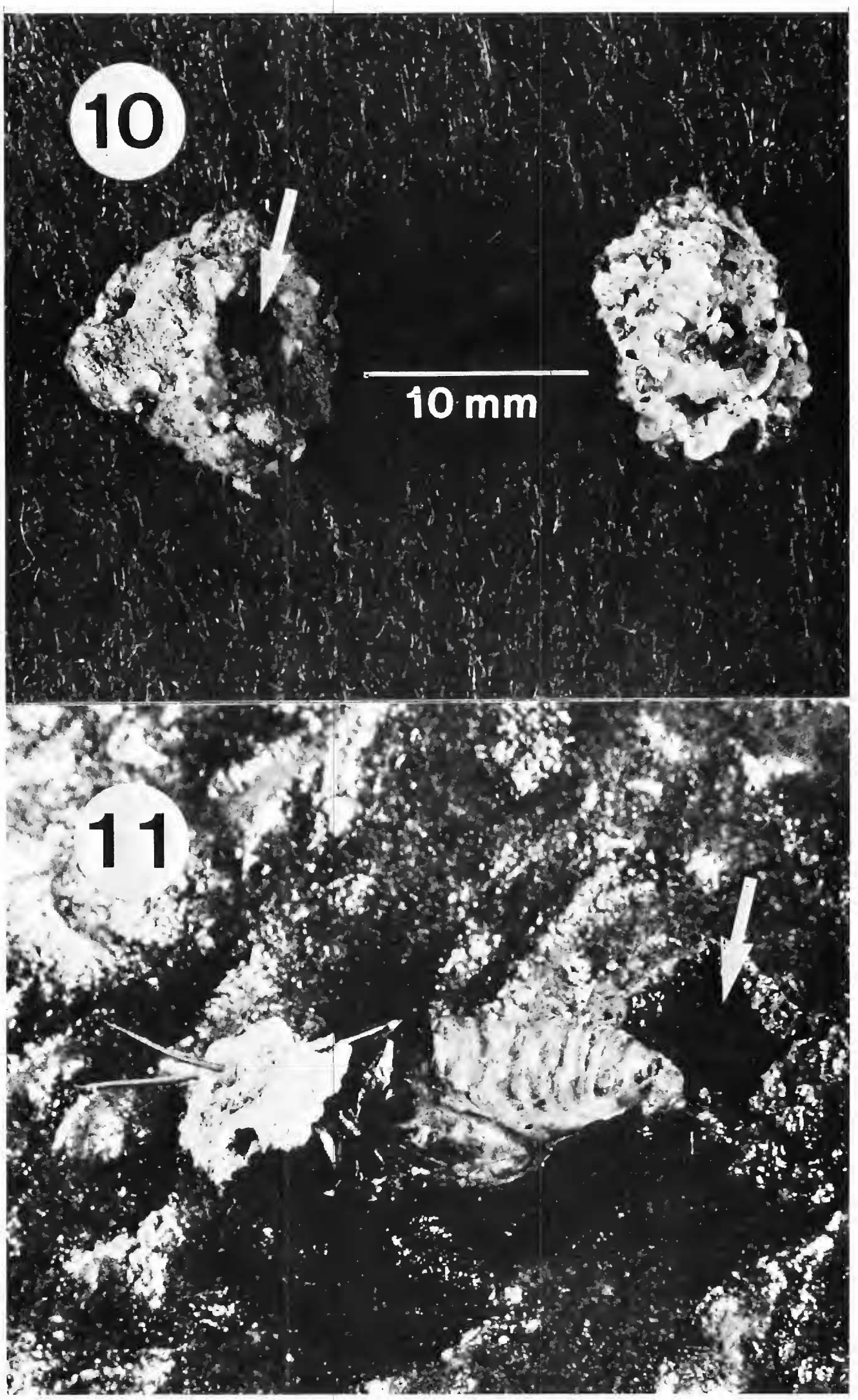
Figures 5–7. *Tachytrechus auratus*. 5. Pupa, ventral view. 6. Same, lateral view. 7. Same, dorsal view. Abbreviations: (ACT) apical cephalic tubercle. (AS) antennal sheath. (FFS) frontal facial suture. (RH) respiratory horn.

Pupa (Figs. 5, 6, 7).—Total length 6.4–6.8 mm from abdominal tip to apical cephalic tubercle; thorax in dorsal view 1.5–1.9 mm wide; body amber; sutures, tubercles, and respiratory horn bases dark brown; prothoracic respiratory horns 2.0–2.3 mm long, directed forward, slightly curved, unsegmented, terminating in sharp points, distal tip of each horn appears to bear minute pores. Frontal region swollen; frontofacial sutures straight; apical cephalic tubercle large, comprised of 4 blunt points. Male pupa with antennal sheaths free and movable, 1.4–1.5 mm long; reaching to pedothecae 1, enlarged at tips to accommodate apical lamellae of adult male antennae. Dorsal surface of thorax with 3 setae on each side of midline; pterothecae smooth, asetose. Pedothecae 1 extend to posterior edge of abdominal segment 2; pedothecae 2 extend to abdominal segment 4; pedothecae 3 extend to





Figures 8–9. *Tachytrechus auratus*. 8. Pupal cocoons of soil. 9. Same, composed of soil and plant roots. Arrows indicate emergence holes.



Figures 10–11. *Tachytrechus auratus*. 10. Pupal cocoons of sand grains. 11. Pupal exuvium with cocoon cap surrounding respiratory horns. Arrows indicate emergence holes.

abdominal segment 5, tips slightly separated. Abdomen 9-segmented, curved, tapered and blunt posteriorly; transverse spiniferous bands on dorsal surfaces of segments 2–8, spines increasing in size mesally. (Based on 2 pupae and 8 pupal exuviae.)

Cocoon (Figs. 8, 9, 10).—Length 10.5–15.3 mm; width 8.2–12 mm; irregularly shaped, composed of either fine soil particles, plant roots, or sand grains from substrate; color variable, but generally gray; inner surfaces glassy and smooth when fresh; outer surface often textured. Cocoon tightly encapsulates pupa, leaving only respiratory horns exposed; opening in cocoon for adult emergence 1.6–2.3 mm diam.; cap from exit hole often left on respiratory horns of pupal exuvium (Fig. 11). (Based on 23 cocoons.)

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Literature Cited

Beaver, R. 1966. The biology and immature stages of two species of *Medetera* (Diptera: Dolichopodidae) associated with the bark beetle *Scolytus scolytus* (F.). Proc. R. Entomol. Soc. (A), 41:145–154.

Corpus, L. D. 1983. Observations on the behavior, morphology, and distribution of six species of long-legged flies (Diptera: Dolichopodidae). M. S. Thesis. Wash. St. Univ. 85 pp.

———. 1986. Biological notes and descriptions of the immature stages of *Pelastoneurus vagans* Loew (Diptera: Dolichopodidae). Proc. Entomol. Soc. Wash., 88:673–679.

Dyte, C. E. 1967. Some distinctions between the larvae and pupae of the Empididae and Dolichopodidae (Diptera). Proc. R. Entomol. Soc. (A), 42:119–128.

Kuenzel, W. J. and R. G. Wiegert. 1977. Energetics of an insect predator, *Tachytrechus angustipennis* (Diptera). Oikos, 28:201–209.

Robinson, H. and J. R. Vockeroth. 1981. Dolichopodidae. p. 625–639. *In* J. McAlpine et al. A manual of the Nearctic Diptera. Vol. 1. Biosystematics Research Institute, Monogr. 27. Ottawa. 674 p.

Smith, M E. 1952. Immature stages of the marine fly, *Hypocharassus pruinosis* Wh., with a review of the biology of immature Dolichopodidae. Am. Midl. Nat., 48:421–432.

Ulrich, H. 1980. Zur systematischen Gliederung der Dolichopodiden (Diptera). Bonn. Zool. Beitr., 31:385–402.

Vaillant, F. 1949. Les premiers stades de *Tachytrechus notatus* Stann. et de *Syntormon zelleri* Lw. (Dolichopodidae). Bull. Soc. Zool. Fr., 74:122–126.

———. 1951. Notes biologiques sur quelques *Tachytrechus* d'Afrique (Dipteres Dolichopodidae). Bull. Soc. Zool. Fr., 76:379–383.